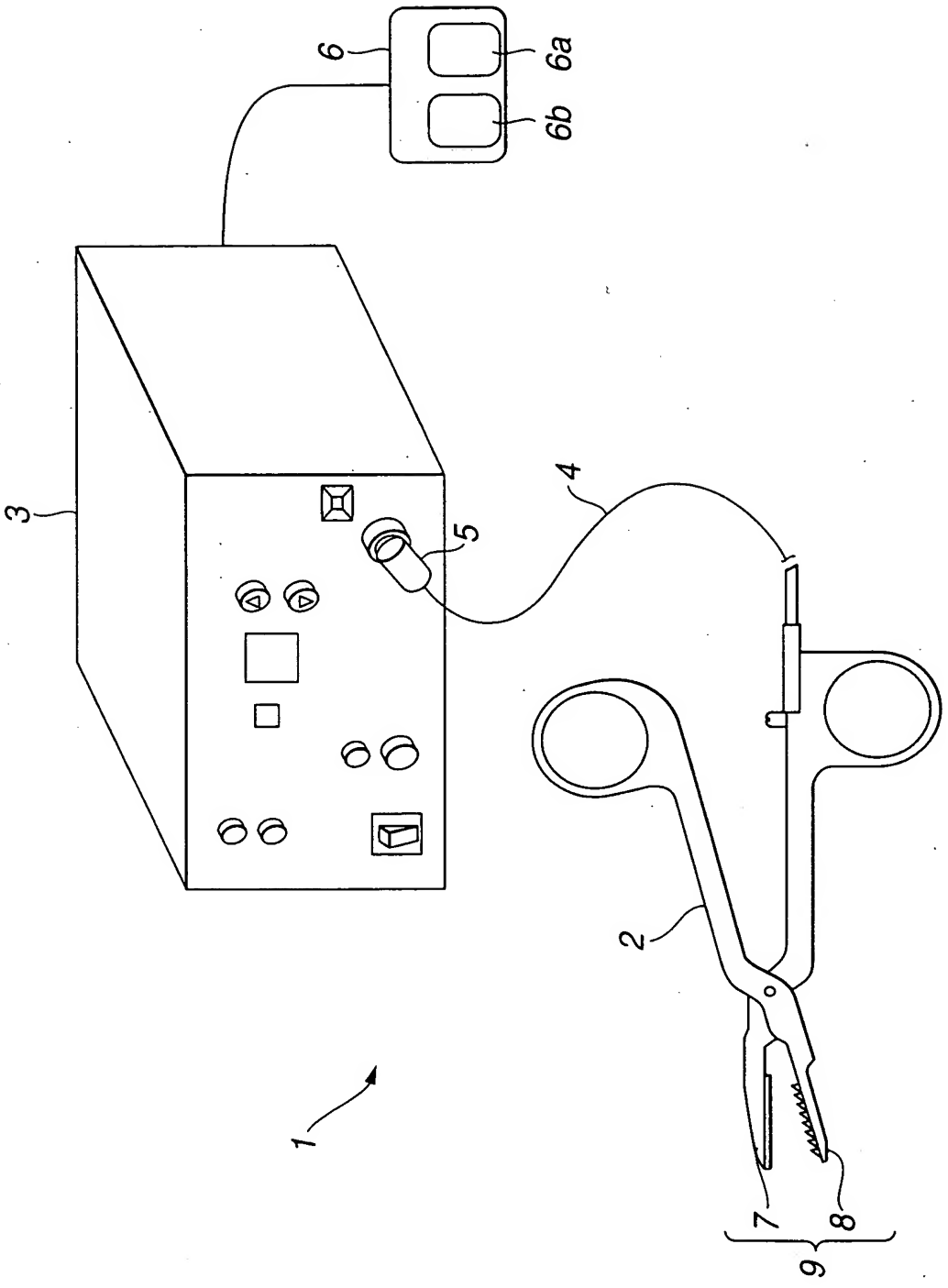
FIG.1



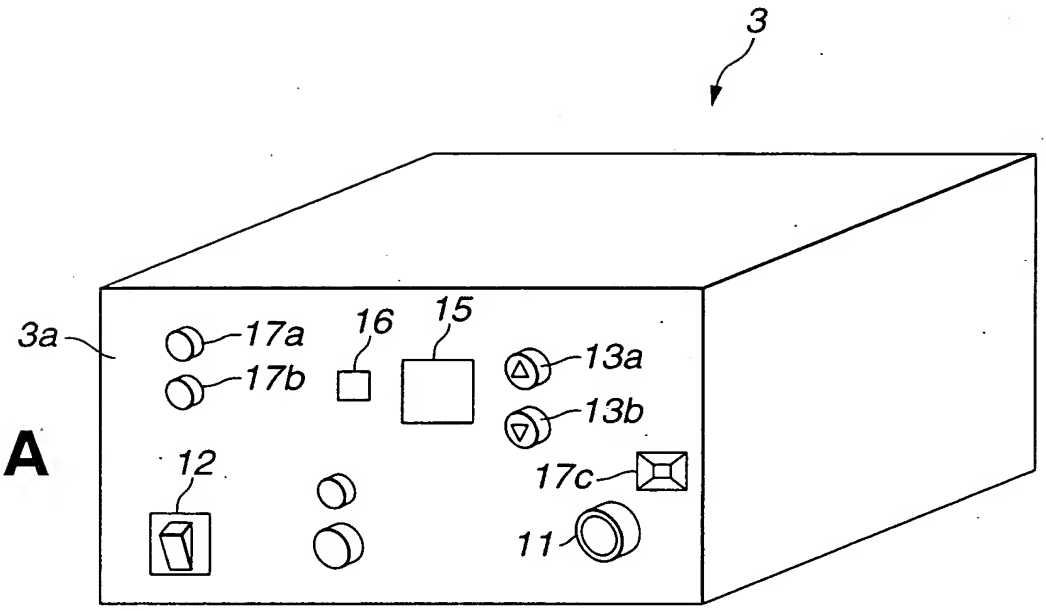


FIG.2A

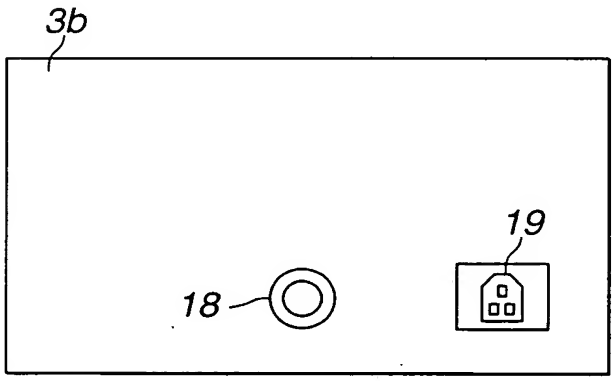


FIG.2B

FIG.3

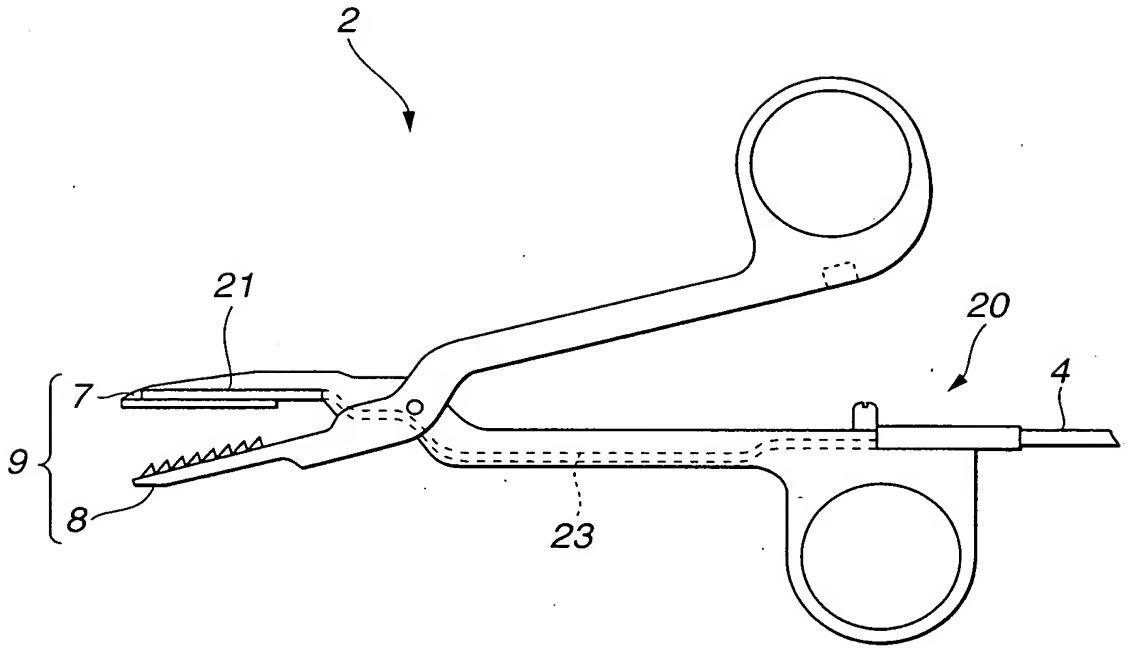


FIG.4A

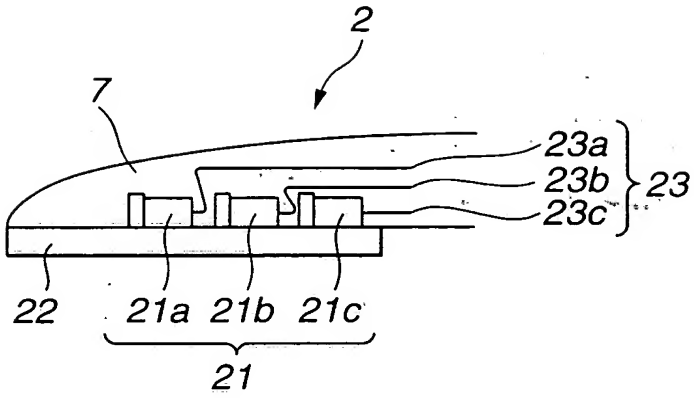


FIG.4B

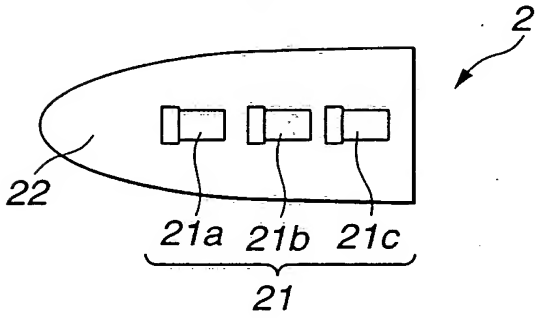
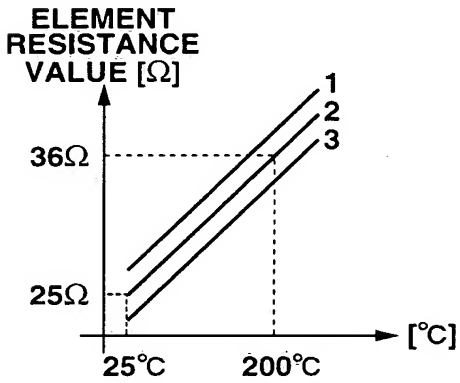


FIG.7



RELATIONSHIP BETWEEN TEMPERATURE AND ELEMENT RESISTANCE VALUE

FIG.8

FORCEPS IDENTIFICATION TABLE

FORCEPS TYPE	IDENTIFICATION GROUP NUMBER	NUMBER OF ELEMENTS	FORCEPS IDENTIFIER
TWEEZERS FORCEPS	A	1	10kΩ
FORCEPS FOR LAPAROSCOPIC SURGERY	B	2	20kΩ
FORCEPS FOR SURGERY	C	3	30kΩ

FIG.5A

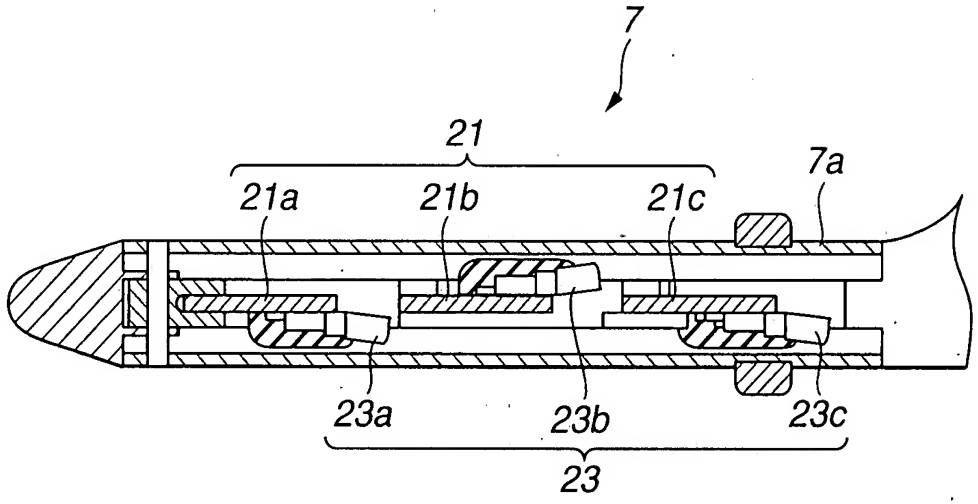


FIG.5B

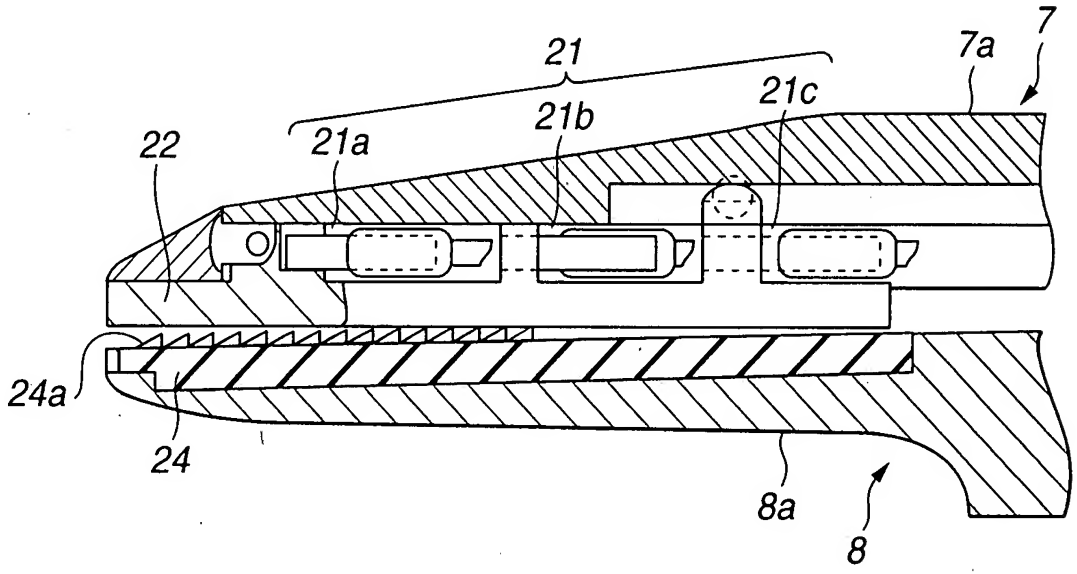


FIG.6

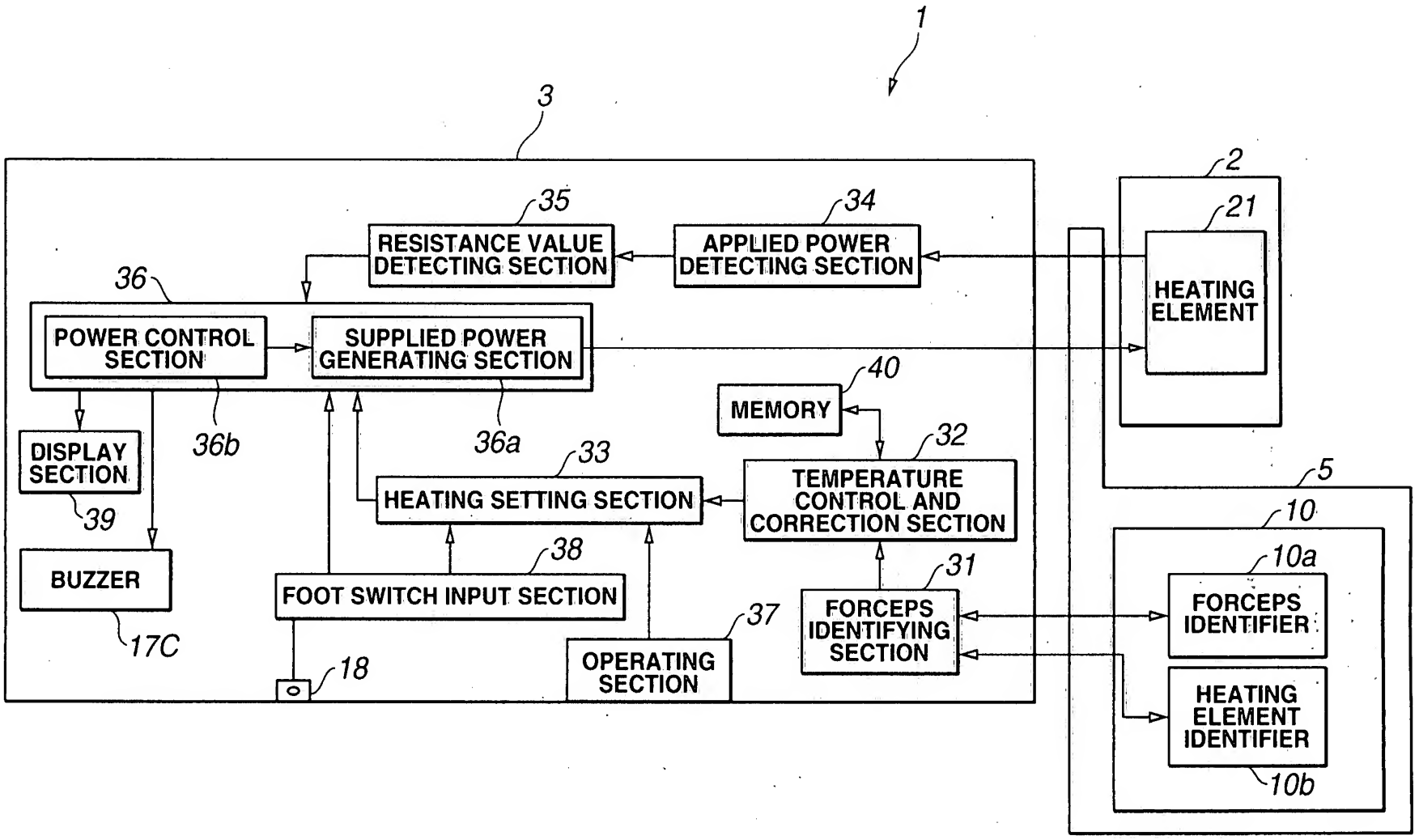

1
3
2
21
HEATING ELEMENT
35
RESISTANCE VALUE DETECTING SECTION
34
APPLIED POWER DETECTING SECTION
36
POWER CONTROL SECTION
SUPPLIED POWER GENERATING SECTION
36b
36a
40
MEMORY
32
DISPLAY SECTION
39
33
HEATING SETTING SECTION
TEMPERATURE CONTROL AND CORRECTION SECTION
5
10
10a
38
BUZZER
17C
FOOT SWITCH INPUT SECTION
31
FORCEPS IDENTIFYING SECTION
FORCEPS IDENTIFIER
37
18
OPERATING SECTION
HEATING ELEMENT IDENTIFIER
10b

FIG.9

CLASSIFICATION OF HEATING ELEMENT GROUPS IN ACCORDANCE WITH HEATING ELEMENT INITIAL CHARACTERISTICS (INITIAL RESISTANCE VALUE)

INITIAL CHARACTERISTICS OF HEATING ELEMENT (RANGE OF INITIAL RESISTANCE VALUE)	IDENTIFICATION GROUP NUMBER	HEATING ELEMENT IDENTIFIER 10b
26±0.5Ω	1	10kΩ
25±0.5Ω	2	20kΩ
24±0.5Ω	3	30kΩ

FIG.10

TABLE : SET TEMPERATURE RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT (IN MEMORY 40)

SET LEVEL	RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT [Ω] "HEATING ELEMENT INITIAL CHARACTERISTICS" IDENTIFICATION GROUP NUMBER		
	1	2	3
1 (180°C)	32	31	30
2 (190°C)	34	33	32
3 (200°C)	36	35	34
4 (210°C)	38	37	36
5 (220°C)	40	39	38

FIG.11

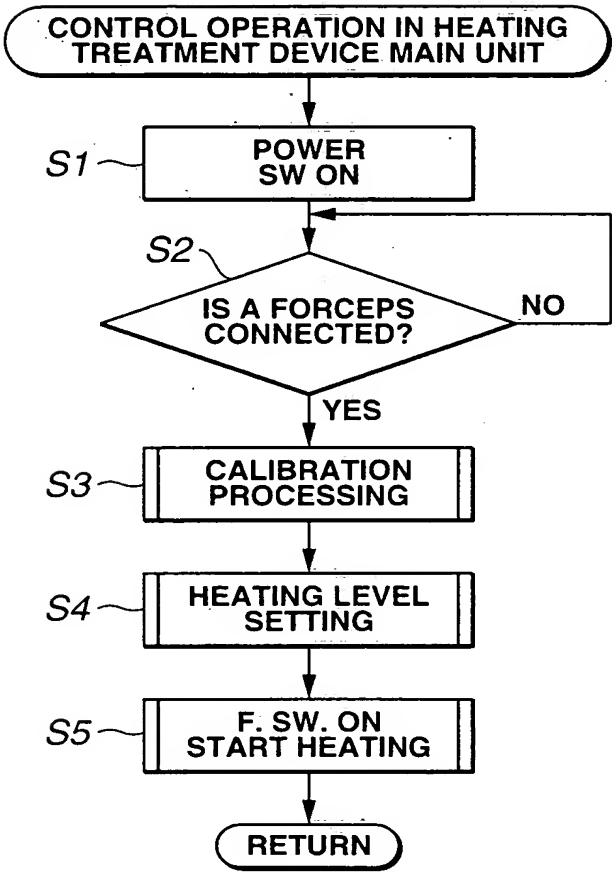

CONTROL OPERATION IN HEATING TREATMENT DEVICE MAIN UNIT
S1
POWER SW ON
S2
IS A FORCEPS CONNECTED?
NO
YES
S3
CALIBRATION PROCESSING
S4
HEATING LEVEL SETTING
S5
F. SW. ON START HEATING
RETURN

FIG.12

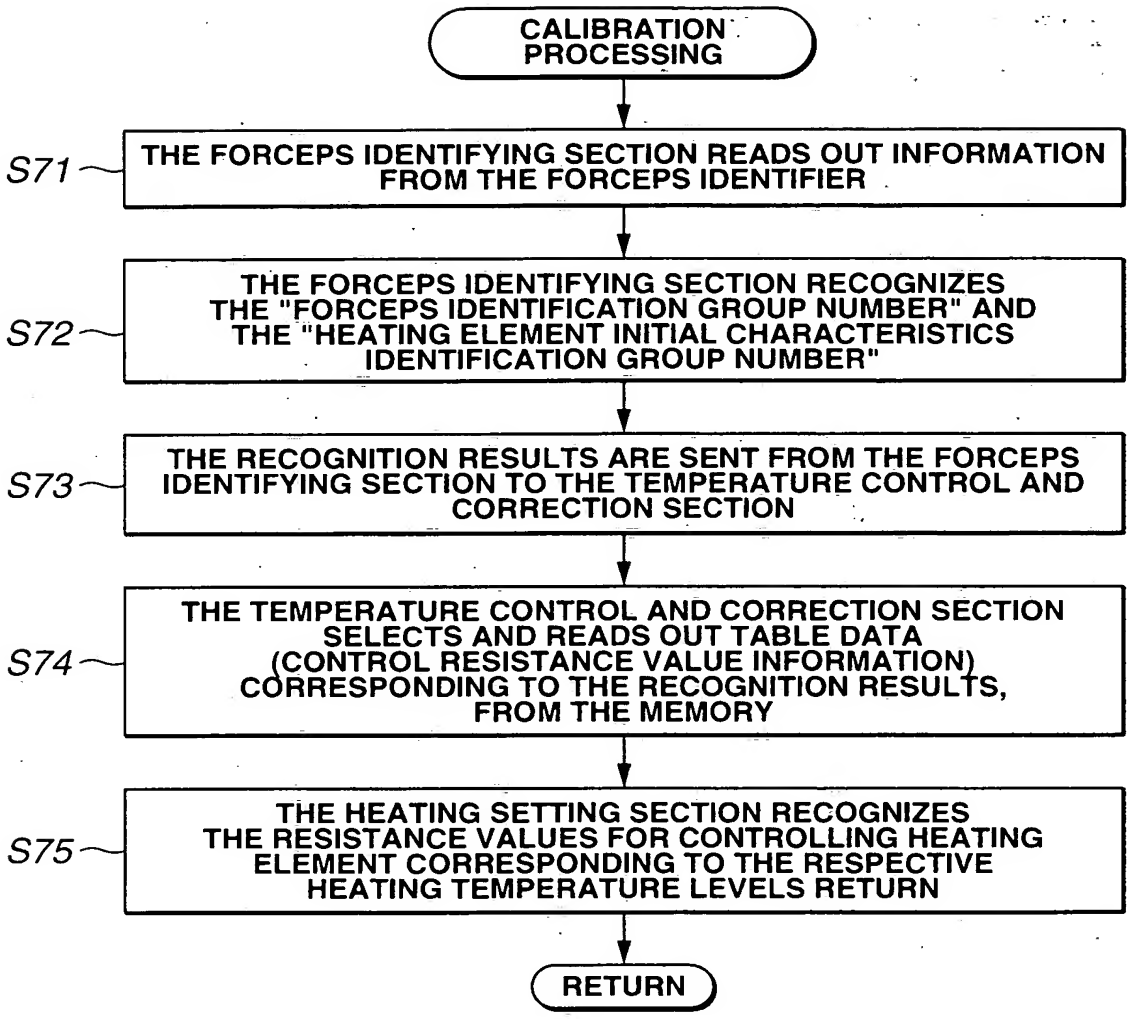

CALIBRATION PROCESSING
S71
THE FORCEPS IDENTIFYING SECTION READS OUT INFORMATION FROM THE FORCEPS IDENTIFIER
S72
THE FORCEPS IDENTIFYING SECTION RECOGNIZES THE "FORCEPS IDENTIFICATION GROUP NUMBER" AND THE "HEATING ELEMENT INITIAL CHARACTERISTICS IDENTIFICATION GROUP NUMBER"
S73
THE RECOGNITION RESULTS ARE SENT FROM THE FORCEPS IDENTIFYING SECTION TO THE TEMPERATURE CONTROL AND CORRECTION SECTION
S74
THE TEMPERATURE CONTROL AND CORRECTION SECTION SELECTS AND READS OUT TABLE DATA (CONTROL RESISTANCE VALUE INFORMATION) CORRESPONDING TO THE RECOGNITION RESULTS, FROM THE MEMORY
S75
THE HEATING SETTING SECTION RECOGNIZES THE RESISTANCE VALUES FOR CONTROLLING HEATING ELEMENT CORRESPONDING TO THE RESPECTIVE HEATING TEMPERATURE LEVELS RETURN
RETURN

FIG.13

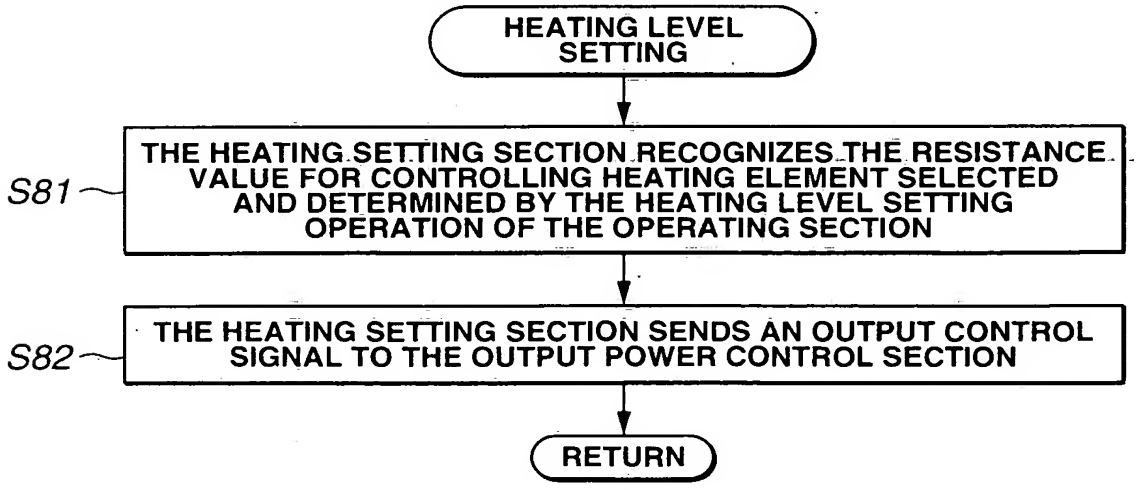

HEATING LEVEL SETTING
S81
THE HEATING SETTING SECTION RECOGNIZES THE RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT SELECTED AND DETERMINED BY THE HEATING LEVEL SETTING OPERATION OF THE OPERATING SECTION
S82
THE HEATING SETTING SECTION SENDS AN OUTPUT CONTROL SIGNAL TO THE OUTPUT POWER CONTROL SECTION
RETURN

FIG.14

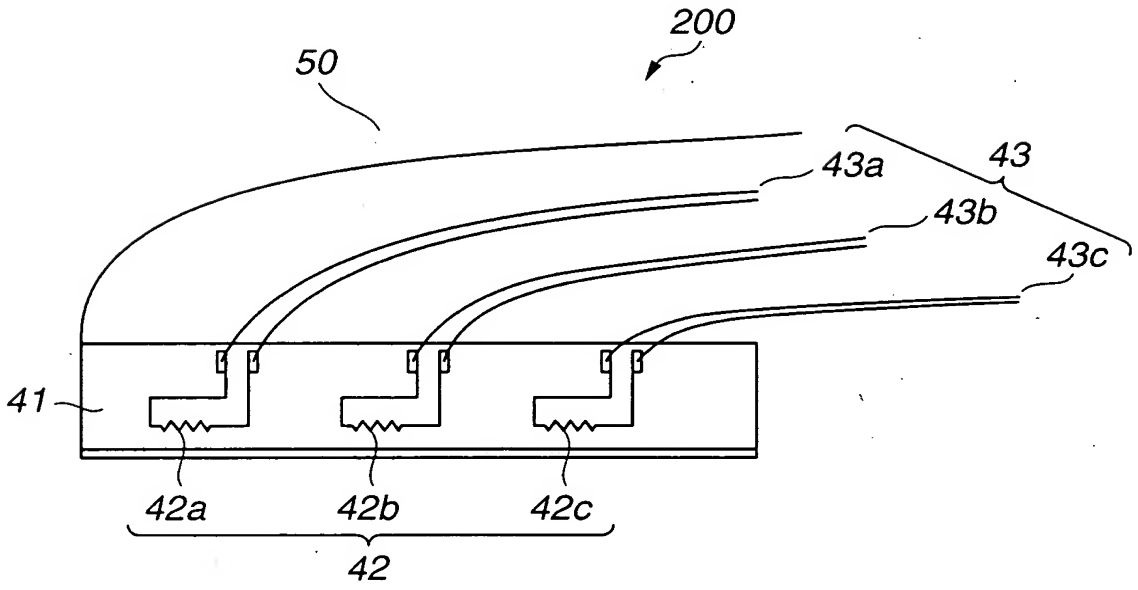


FIG.15

CLASSIFICATION OF HEATING PATTERN GROUPS IN ACCORDANCE WITH HEATING PATTERN INITIAL CHARACTERISTICS (INITIAL RESISTANCE VALUE)

INITIAL CHARACTERISTICS OF HEATING PATTERN (RANGE OF INITIAL RESISTANCE VALUE)	IDENTIFICATION GROUP NUMBER	HEATING PATTERN IDENTIFIER 50b-1, 50b-2, 50b-3
26±0.5Ω	1	10kΩ
25±0.5Ω	2	20kΩ
24±0.5Ω	3	30kΩ

FIG.16

IDENTIFICATION GROUP NUMBER ACCORDING TO INITIAL CHARACTERISTICS OF EACH HEATING PATTERN

HEATING PATTERN IDENTIFIER	50b-1	50b-2	50b-3
IDENTIFICATION GROUP NUMBER	2	1	3

FIG.17

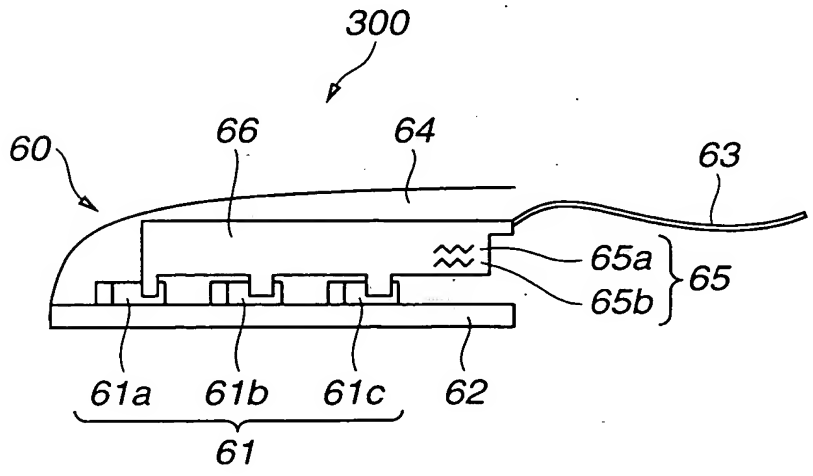


FIG.18

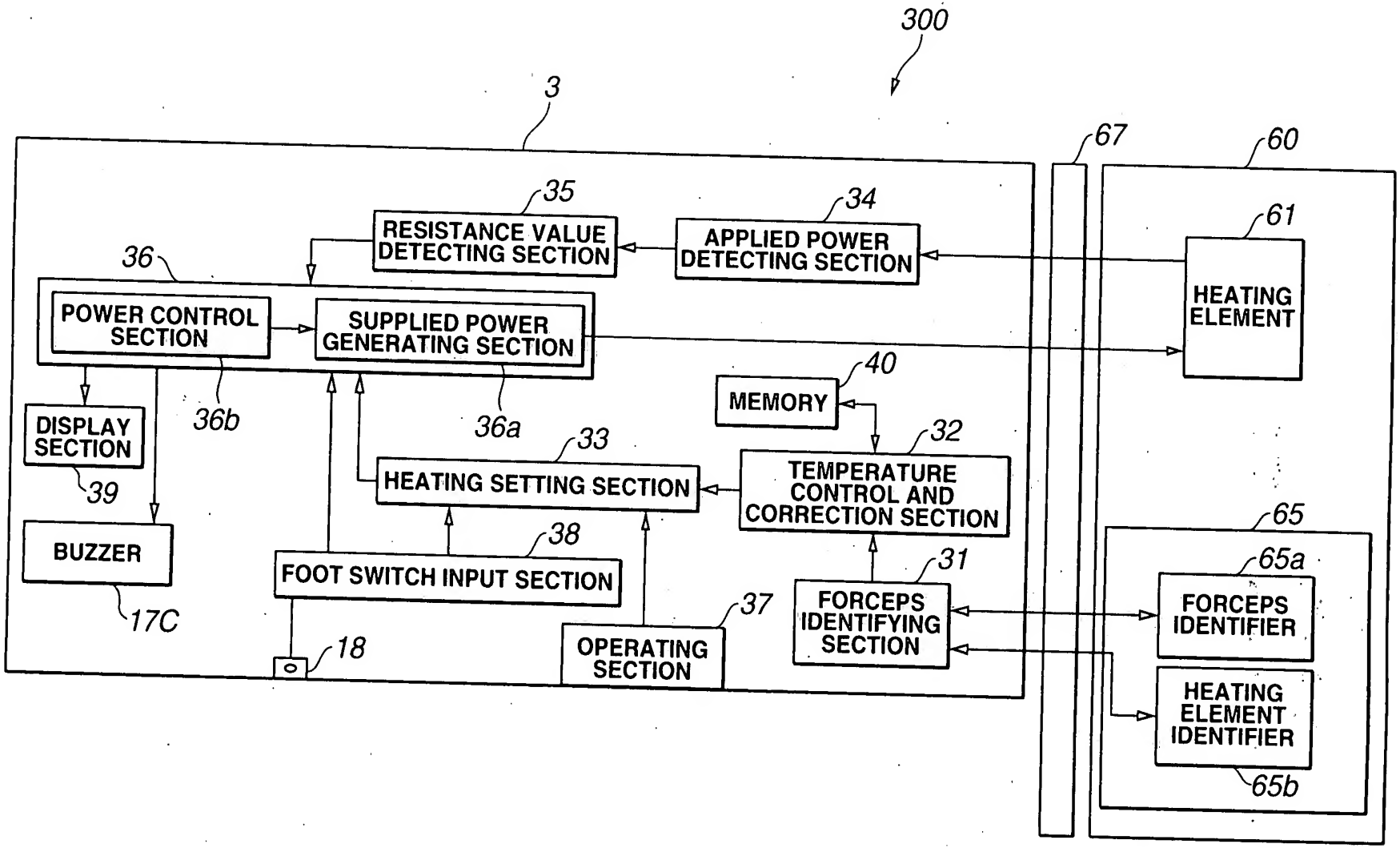

300
3
67
60
35
34
61
RESISTANCE VALUE DETECTING SECTION
APPLIED POWER DETECTING SECTION
36
HEATING ELEMENT
POWER CONTROL SECTION
SUPPLIED POWER GENERATING SECTION
40
MEMORY
DISPLAY SECTION
36b
36a
33
32
39
HEATING SETTING SECTION
TEMPERATURE CONTROL AND CORRECTION SECTION
65
BUZZER
38
31
65a
FOOT SWITCH INPUT SECTION
FORCEPS IDENTIFYING SECTION
FORCEPS IDENTIFIER
17C
37
18
OPERATING SECTION
HEATING ELEMENT IDENTIFIER
65b

FIG.19

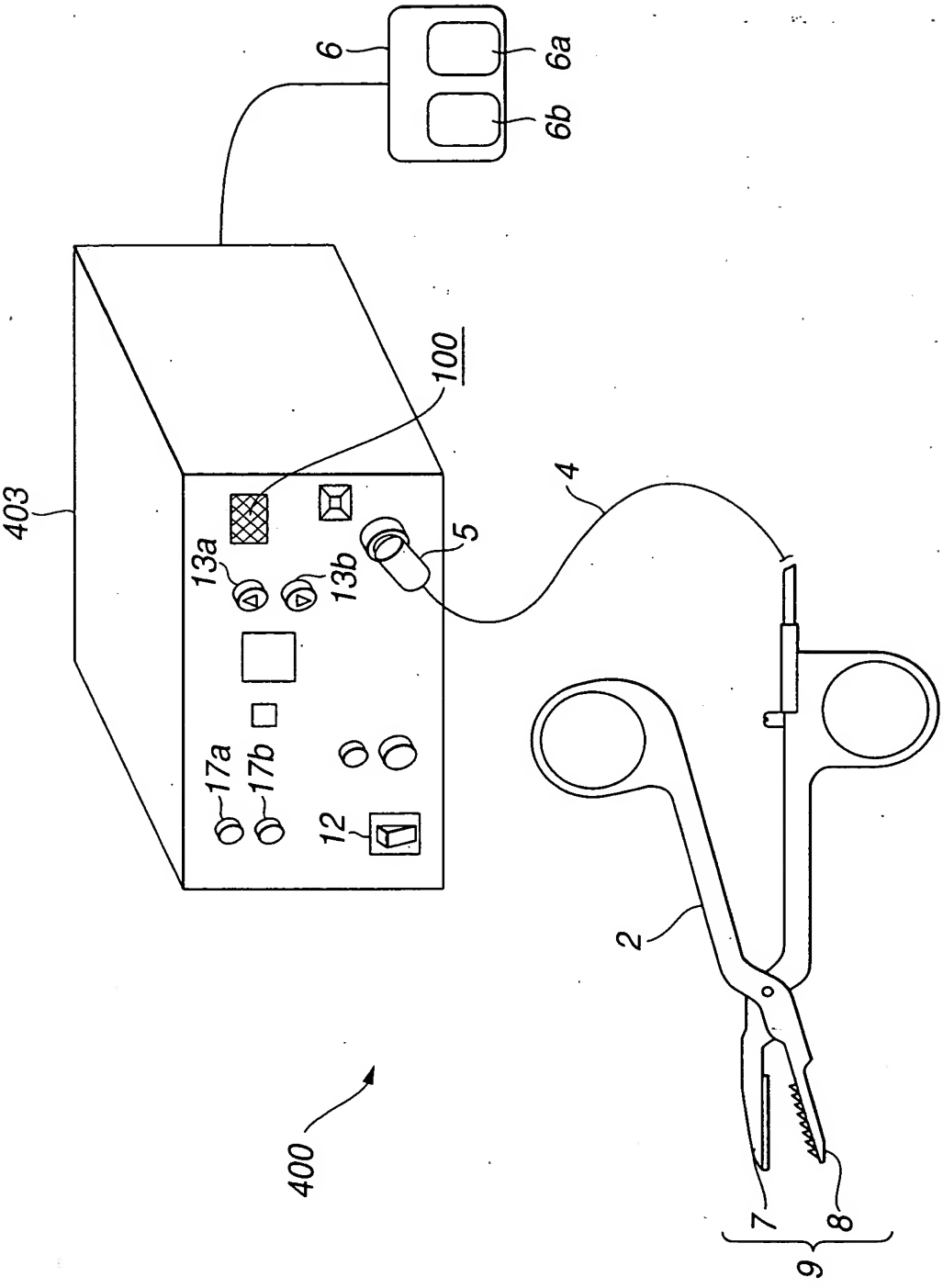


FIG.20

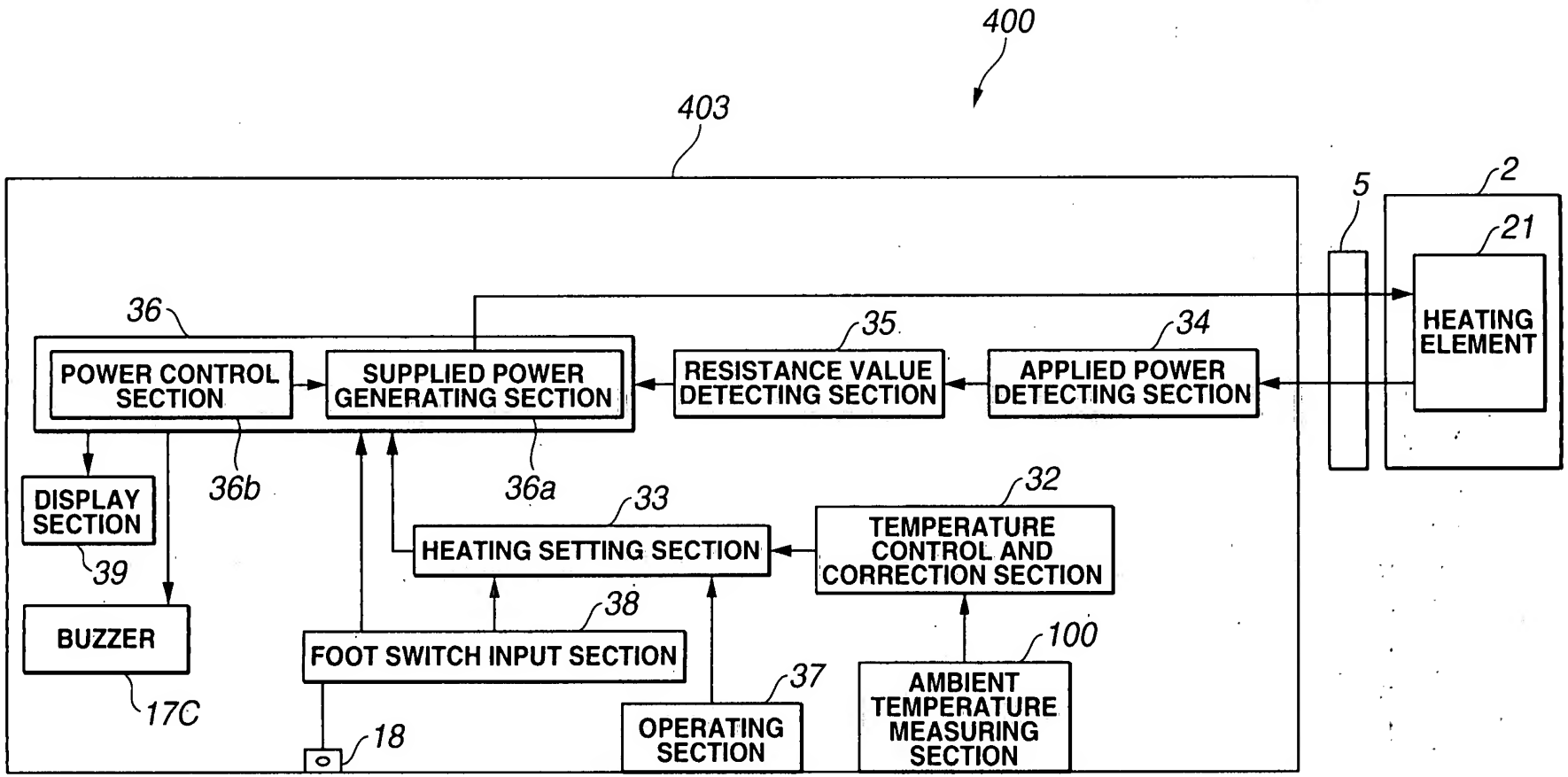

400
403
5
2
21
HEATING ELEMENT
36
POWER CONTROL SECTION
SUPPLIED POWER GENERATING SECTION
35
RESISTANCE VALUE DETECTING SECTION
34
APPLIED POWER DETECTING SECTION
36b
36a
DISPLAY SECTION
39
BUZZER
17C
33
HEATING SETTING SECTION
32
TEMPERATURE CONTROL AND CORRECTION SECTION
38
FOOT SWITCH INPUT SECTION
100
AMBIENT TEMPERATURE MEASURING SECTION
37
OPERATING SECTION
18

FIG.21

TABLE : RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT CALCULATION RESULTS

SET LEVEL	RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT (Ω)		
	HEATING ELEMENT TYPE		
	HEATING ELEMENT 21a	HEATING ELEMENT 21b	HEATING ELEMENT 21c
1(180°C)	30	31	32
2(190°C)	32	33	34
3(200°C)	34	35	36
4(210°C)	36	37	38
5(220°C)	38	39	40

FIG.22

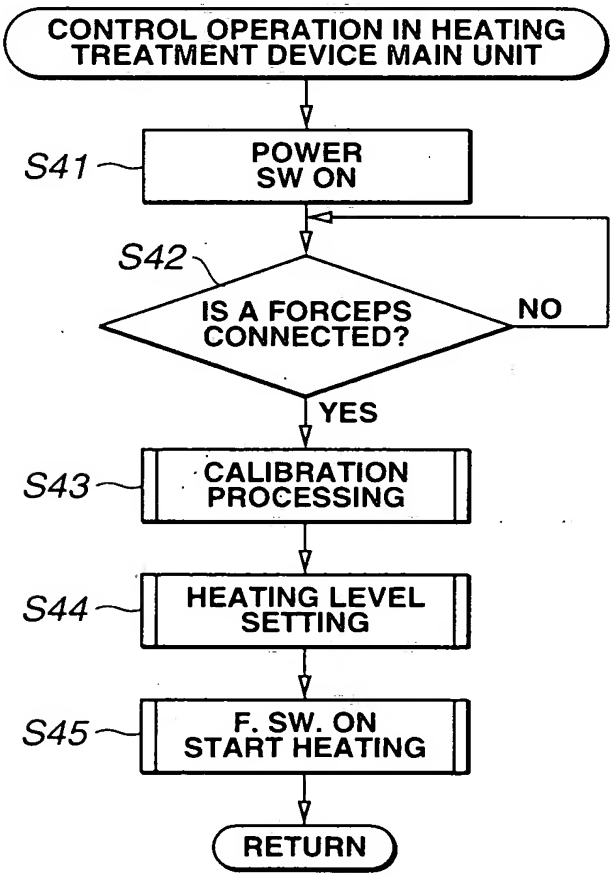


FIG.23

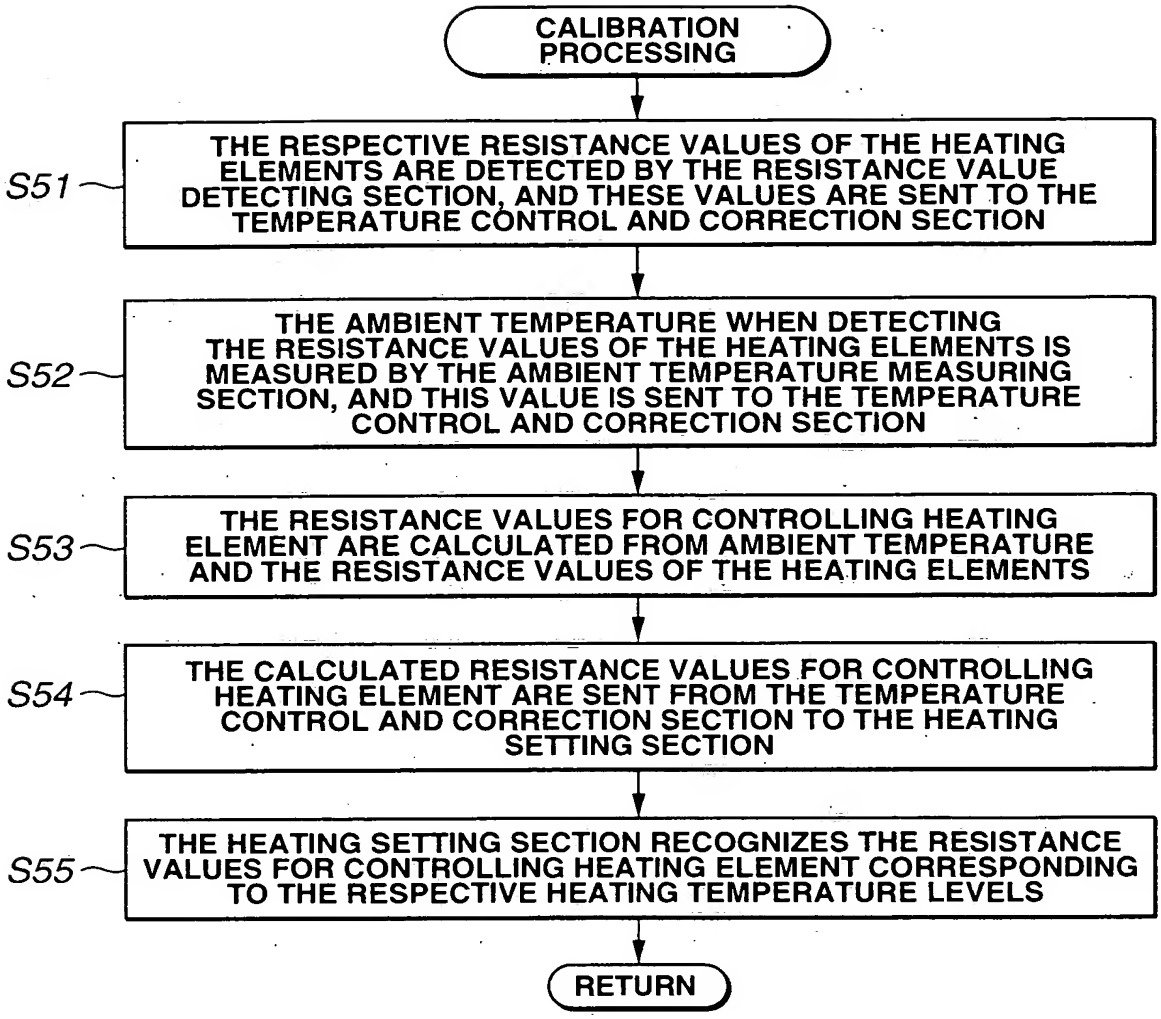
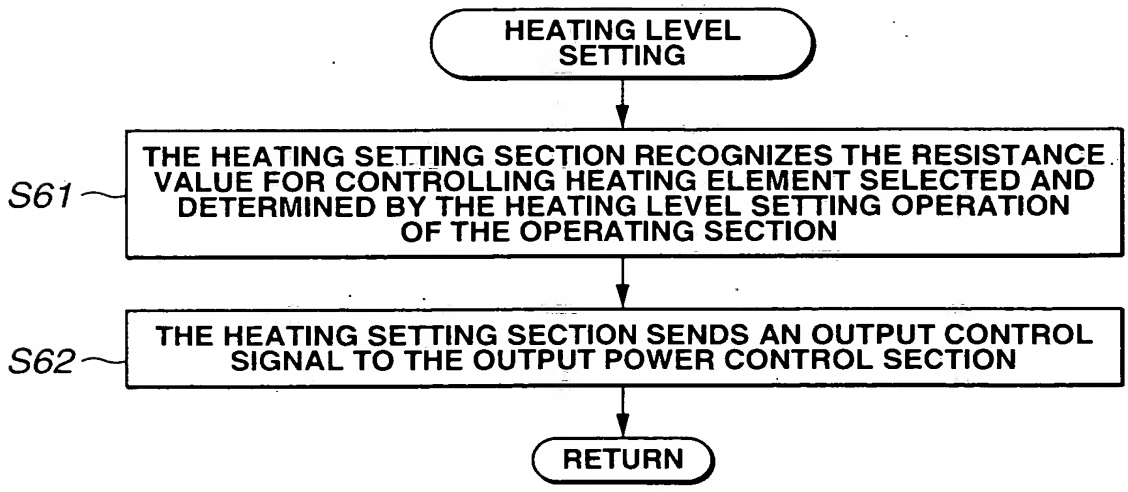

CALIBRATION PROCESSING
S51
THE RESPECTIVE RESISTANCE VALUES OF THE HEATING ELEMENTS ARE DETECTED BY THE RESISTANCE VALUE DETECTING SECTION, AND THESE VALUES ARE SENT TO THE TEMPERATURE CONTROL AND CORRECTION SECTION
S52
THE AMBIENT TEMPERATURE WHEN DETECTING THE RESISTANCE VALUES OF THE HEATING ELEMENTS IS MEASURED BY THE AMBIENT TEMPERATURE MEASURING SECTION, AND THIS VALUE IS SENT TO THE TEMPERATURE CONTROL AND CORRECTION SECTION
S53
THE RESISTANCE VALUES FOR CONTROLLING HEATING ELEMENT ARE CALCULATED FROM AMBIENT TEMPERATURE AND THE RESISTANCE VALUES OF THE HEATING ELEMENTS
S54
THE CALCULATED RESISTANCE VALUES FOR CONTROLLING HEATING ELEMENT ARE SENT FROM THE TEMPERATURE CONTROL AND CORRECTION SECTION TO THE HEATING SETTING SECTION
S55
THE HEATING SETTING SECTION RECOGNIZES THE RESISTANCE VALUES FOR CONTROLLING HEATING ELEMENT CORRESPONDING TO THE RESPECTIVE HEATING TEMPERATURE LEVELS
RETURN

FIG.24


HEATING LEVEL SETTING
S61
THE HEATING SETTING SECTION RECOGNIZES THE RESISTANCE VALUE FOR CONTROLLING HEATING ELEMENT SELECTED AND DETERMINED BY THE HEATING LEVEL SETTING OPERATION OF THE OPERATING SECTION
S62
THE HEATING SETTING SECTION SENDS AN OUTPUT CONTROL SIGNAL TO THE OUTPUT POWER CONTROL SECTION
RETURN